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ALUMINUM DEPOSITION PROCESS

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ALUMINUM DEPOSITION PROCESS

[Aruminiumuno johchaku houhoh]

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Claims

1. A process wherein an aluminum wire is continuously vaporized and deposited on a base, which aluminum deposition process is characterized by the fact that the aforementioned aluminum wire is annealed ahead of time at a temperature in the range of 100 to 550°C.
2. The aluminum deposition process described in Claim 1 of the present invention in which the annealing is done under reduced atmospheric pressure.
3. The aluminum deposition process described in Claim 2 of the present invention in which the reduced pressure atmosphere is a vacuum of 1 Torr or below.

4. The aluminum deposition process described in Claim 1, 2, or 3 of the present invention in which the aluminum wire has a purity of 99.9% or higher.

Detailed explanation of the invention

Technical Field

The present invention pertains to a process for deposition of aluminum onto a base.

Background

For example, for various aluminum-deposited products such as metallized condensers and digital disks, those with a base material such as paper, insulation film, or metal sheet deposited with aluminum are used.

For the deposition source used for the aluminum deposition process,

θ a process where a molten aluminum is used inside a crucible,

ω a process where an aluminum wire is fed onto a heater made of W, etc., and vaporized while melting,

ε a process where an aluminum wire is continuously supplied to a heated base material and continuously vaporized by the heat of the base material.

Among those listed above, the processes described in θ and ε are used for industrial production, but these processes have the problems described below associated with them.

In the method described in θ, the amount of the aluminum is determined by the capacity of the crucible; thus, the maximum single unit length is determined by the crucible, continuous operation is not possible, and the length of the product is short.

In the method of ε, the oily components and moisture on the surface of the aluminum wire or solid solution and H₂ gas included in the aluminum enters the deposition film at the time of melting and depositing; thus, the quality of the deposition film is degraded.

Presentation of the invention

The present invention eliminates the above-mentioned problems and by providing an aluminum deposition process capable of forming a long, single-unit length and continuously producing a high-quality aluminum deposition film.

The present invention is an aluminum deposition process characterized by the fact that the aforementioned aluminum wire is annealed ahead of time at a temperature in the range of 100 to 550°C in a process where an aluminum wire is continuously vaporized and deposited on a base. In the present invention, the aluminum wire is annealed ahead of time at a temperature in the range of 100 to 550°C so as to remove oily components and moisture on the surface and to

reduce the H_2 gas inside the aluminum, and to increase the quality of the deposition film, and when the temperature used is 100°C or below, removal of oily components and moisture on the surface and reduction of H_2 gas in the aluminum are insufficient; on the other hand, when the temperature exceeds 550°C , reduction of H_2 gas is absent and, instead, H_2 gas is absorbed, resulting in the opposite effect.

Furthermore, annealing may be done in air in the present invention, but a reduced gas atmosphere is preferred and, in this case, the H_2 gas inside the aluminum can be further reduced, and the quality of the deposition film can be further increased. A higher degree of vacuum in the atmosphere is desired, but the effect achieved is significant when at 1 Torr or below; thus, 1 Torr or below is desirable.

In the present invention, the above-mentioned annealing treatment can be done continuously on the supply line before continuously feeding the aluminum wire for deposition, or it can be done in a separate continuous or batch-system process. In order to prevent redeposition of moisture, gas, etc., it is desirable that sealing be done in vacuum of 1 Torr or below or with Ar gas, before continuous deposition or after the annealing treatment.

Application Examples

An aluminum wire with a purity of 99.99% and a diameter of 1.6 mm was produced by standard casting, rolling, and wire-drawing, and the oil used for the wire-drawing was removed with methyl ethyl ketone. The aforementioned wire was annealed under the conditions shown in Table 1 and deposited continuously onto a PET (polyethylene terephthalate) base under conditions where the degree of vacuum was 10^{-5} Torr.

For the aluminum-deposited sheets produced, an evaluation of the deposited film was done based on the number of pinholes, etc., on the surface of the deposited film, and the results obtained are shown in Table 1 below.

The number of pinholes is shown where the pinholes in a degreased aluminum wire before annealing (Comparative Example No. 12) is defined as 1 and the value is shown as a relative value.

As shown in Table 1, in No. 1 to No. 10 of the present invention, pinholes are reduced in the deposition film and the higher the degree of vacuum used for the annealing atmosphere, the lower the number of pinholes.

Table 1

① 種 別	② 試 験 条 件				③ ピンホール数
	④ 温度 (°C)	⑤ 時間 (Hr)	⑥ 真空度の真空度 (Torr)	⑦ 試 験 条 件	
⑦ 本 発 明	1	300	10	⑧ 大気中	0.50
	2	200	10	"	0.50
	3	450	20	"	0.50
	4	300	10	"	0.50
	5	350	15	"	0.50
	6	380	12	"	0.48
	7	350	20	10 ⁻¹	0.50
	8	350	10	10 ⁻¹	0.22
	9	350	15	10 ⁻²	0.20
	10	300	20	10 ⁻²	0.21
⑨ 比 較 例	11	300	10	⑧ 大気中	1.00
	12	—	—	—	1.00

- Key: 1 Type
 2 Annealing conditions
 3 Number of pinholes
 4 Temperature (°C)
 5 Time (Hr)
 6 Degree of vacuum (Torr)
 7 Present invention
 8 In air
 9 Comparative examples

Effect of the invention

The deposition process for aluminum structured as described above offers the effects listed below.

(a) The aforementioned aluminum wire is annealed ahead of time, before deposition, at a temperature in the range of 100 to 550°C so that oily components and moisture on the surface of the aluminum are removed, the H₂ gas inside the aluminum is reduced, and a high-quality deposition film can be produced.

(b) An aluminum wire is used for deposition; thus, continuous operation is made possible and production of an aluminum-deposited product with a long, single-unit length is possible.

(c) When annealing is done under reduced pressure, a further reduction of H₂ gas included in the aluminum is made possible, thus the quality of the deposition film can be increased further.